

THURSDAY, JUNE 18, 1908.

THE FRESH-WATER FISHES OF CENTRAL AMERICA.*Biologia Centrali-Americana. Pisces.* By C. Tate Regan. Pp. xxxiii+203; with 26 plates and 2 maps. (1906-8.)

WE have to congratulate the editor of this magnificent work on the regularity with which the issue of the parts, now 200 in number, is proceeding, thus bringing its completion within measurable distance. Many a time, when, during its progress, collection after collection arrived, each bringing insects in tens of thousands, besides specimens of almost every other class of animals, the prospect of completing the work must have appeared almost hopeless, and this still more so when the editorial labours were thrown entirely upon Mr. Godman after the death of his coadjutor, Osbert Salvin. When the founders of the "Biologia" planned the work, now some forty years ago, they were moved to this grand enterprise by a clear perception of the important bearing which an intimate knowledge of the fauna of Central America, as a transition area between the Nearctic and Neotropical regions, must have upon the wider questions of the changing distribution of animals generally, and of their evolution since Tertiary times. But we believe that their original estimate, both of the number of species and of the extent of the work, was greatly exceeded in the course of those years. Nevertheless, their determination and energy have never failed them.

The volume with which we propose to deal on the present occasion is that containing an account of the fishes. Its appearance marks also the completion of the whole division of vertebrates. The preparation was entrusted to Mr. C. Tate Regan, who by his previous work on Neotropical fishes had shown himself eminently qualified for the task. The editor was most fortunate in his selection, for in the short space of two years he saw a work completed which was not only difficult in itself, but was rendered more laborious by the numerous contributions to Central American ichthyology which have appeared during the last two decades, and which, of course, had to be carefully consulted and studied.

The author has restricted himself almost entirely to fresh-water fishes and to such marine forms as are known to ascend rivers beyond the influence of the tide. In accordance with the plan generally followed in the "Biologia," detailed descriptions, with full references to previous publications, are given in the case of groups or species which to the author appeared to need revision, and for which the requisite materials were to be found in the British Museum. The remainder are merely mentioned by name, with the addition of such distinctive characters as may be compressed in a synopsis or key.

We find, then, that the number of species described is 330, including some truly marine forms which for

comparison, or other reasons, had to be referred to. This is a surprisingly small number considering that about 700 reptiles and 200 batrachians are known from the same area—an area which has been peopled from two regions, the Nearctic and the Neotropical, and also by migrations from two oceans; offering every variation of physical condition most favourable to the development of fish-life; intersected by networks of river systems, without intercommunication; and with large expanses of water severally containing numerous representatives of the same genus. An area such as this must nourish a multitude of specific forms, of which only a fraction are as yet known to us. We can therefore fully concur with the author when he says that our knowledge of the fishes of Central America and Mexico must still be regarded as very incomplete. He directs attention to the fact that not a single fresh-water fish has as yet been described from Honduras or from Nicaragua north and east of the Great Lakes. He might have added that fishes, for obvious reasons, are not favourites with the generality of collectors. Extensive collections are only made by those who are especially interested in the subject; and we believe that since Salvin, assisted by Capt. Dow and Mr. Godman, formed his collection, no other of equal extent has been made, unless it be that of Mexican fishes, brought together by Dr. Meek. We must not omit to mention here that the acquisition by the British Museum of numerous types or co-types from various, especially American, sources is chiefly due to the efforts of Mr. Regan himself.

The systematic work has been carried out in every detail with painstaking care and accuracy. Generally we notice with pleasure that in nomenclature he has kept free from the crotchets of modern reformers, and has remained faithful to the classical spirit which one expects to find in a Cambridge graduate. With the rich materials at his disposal, and the additional information contained in the writings of his contemporaries, he has aimed at a precise definition of genera and species, by which their identification has been much more facilitated than if he had prepared those lengthy descriptions which too frequently prove a snare for the student.

We cannot enter more fully into the treatment of the subject in the systematic section of the work, involving in the case of almost every species questions of a purely technical nature. But there is one point which may be mentioned, if only as a suggestion to other authors engaging in similar work. Students would find it a great boon if direct references to good illustrations were always admitted in the "synonymy," instead of references merely to some recent publication, in which they learn for the first time that such illustrations exist. Furthermore, in the case of the "Biologia," it would have been particularly appropriate to give direct references to figures of species discovered by Salvin, and drawn from specimens collected by him. We allude, *inter alia*, to the genus *Heros* and its allies, for which Mr. Regan has adopted the Swainsonian name "*Cichlasoma*."¹

¹ Should be superseded, according to modern nomenclature, by the prior *Cichlaturus*!

In his Introduction the author discusses some questions of more general interest. After having devoted a chapter to the classification of fishes, with special reference to the Central American families, explaining the grounds on which he differs from some of the generalisations proposed in recent years, he proceeds to summarise the conclusions at which he has arrived with regard to the geographical distribution of the fresh-water fishes. He begins with a description of the range of the ten Central American families and of many of their genera, tracing their origin and migrations. Thus he says of the Cichlidæ (*alias* Chromides):—

“The Mexican and Central American Cichlidæ are more specialised than the South American ones, and have certainly been derived from them; not one of the genera with three anal spines is found north of the Isthmus of Panama, and all the South American Cichlidæ have simple conical teeth.”

He rejects the hypothesis of a northern origin of Cichlidæ and of their southward migration into South America, Africa, and Southern India, and adopts the view expressed by other zoologists that

“In early Eocene times Africa was connected by land with South America on the one side, and with India, *via* Madagascar, on the other.”

On the other hand, he takes the Cyprinodontidæ to be an originally Holarctic group, which, moreover, was confined primarily to fresh water. His principal reasons for the latter assumption are:—(1) their absence from the Australian region, except for a species of *Haplochilus* in Celebes and Lombok¹; and (2) the fact that all fossil Cyprinodonts known are from fresh-water or estuarine deposits. Singularly enough, while in the old world all the species retained their oviparous habit, a very large number of the American forms became viviparous; and it is in Central America that some of the most specialised genera were developed within comparatively limited districts. *Anableps* is considered to be endemic to South America, one Central American species being an immigrant from the South.

The Centrarchidæ are also a northern type which is making its way southwards into Central America. Of about thirty species, six extend southwards to the Rio Grande, and one a little further into Tamaulipas. We are glad to see that the author vindicates the North American integrity of this group from the attempt to associate with it the Indo-Pacific *Kuhlia* and its Australian fresh-water allies.

These brief extracts will suffice to direct attention to the many very interesting points on which the author's thorough acquaintance with the subject enables him to speak with authority. Several woodcuts accompany the text, illustrating the distribution of the Central American families over the globe; and on two plates the northern range of Neotropical and the southern range of Nearctic families and subfamilies are shown.

In the division of the Central American sub-

region into provinces, the author does not carry us on firmer ground than had been reached by previous inquiries. However, he expresses it as his opinion that

“for fresh-water fishes the volcanic chain of mountains which stretches across Mexico from Colima nearly to Vera Cruz may be taken as the boundary between the Arctic and Tropical regions. This range has proved an insuperable obstacle to the northward migration of the Neotropical fishes.”

Having thus established a northern and southern division, he distinguishes in the former three provinces, viz.:—

- (1) Northern Mexico, west of the Sierra Madre.
- (2) Rio Grande province.
- (3) The Lerma system.

And in the latter:—

- (1) The Rio Balsas system.
- (2) Rio San Juan, with lakes Managua and Nicaragua.
- (3) Guatemalan province.
- (4) Isthmian province (Costa Rica and Panama).

The author cautiously adds that any division into provinces must be regarded at present as merely provisional, owing to our incomplete knowledge of the fish fauna of this area. We cannot help thinking that he would have much facilitated the labours of future inquirers had he followed the plan of other contributors and given a systematic index of species with a table showing their range so far as at present known.

Finally, in the last chapter of the introduction the author explains his views as regards the partial identity of the fish faunas of the two sides of the isthmus. He adopts the opinion of American ichthyologists that there are very few of the truly marine forms the representatives of which on the two sides cannot be shown to differ in some point; but on the present occasion he takes into consideration such only of the shore fishes as are known to enter fresh water. He has prepared a list of eighteen pairs of such fishes, each pair consisting of an Atlantic and a Pacific representative. The members of each pair differ from each other in various degrees; some of them differ in three or more “tangible,” “substantive” characters (and no systematic ichthyologist would deny them specific rank), while others can scarcely be regarded “as more than subspecifically distinct.” Thus, whatever method is followed by ichthyologists for taxonomic distinction, with the object of accentuating either the amount of differentiation that has taken place since the individuals were separated and isolated, or their previous and still more or less apparent identity, the similarity between species of both sides must be admitted by all to be so great as only to be explicable by a former communication between the two oceans.

The work is illustrated by twenty-six lithographic plates executed by Mr. J. Green in his usual excellent style, and we have to express our hearty thanks to Mr. Tate Regan for having contributed so careful and important a work to Godman and Salvin's great undertaking.

¹ Prof. Max Weber could hardly allow even this exception, having inconspicuously proved that the scanty fresh-water fauna of Celebes is merely an immigration from India.